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Province of Saskatchewan
DEPARTMENT OF AGRICULTURE

THE FEEDING VALUE OF CORN

AN Comparison with other Grains for Feeding Purposes

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It is economy to produce on the farm as much as possible of the rations for our different classes of farm animals. For various reasons, it happens sometimes that the stockman finds himself short of one or more of the important grains or roughage and then he must set about to find substitutes. Or it may be that one important part of the ration is so high in price that it will pay him better to sell it and purchase one or more others to substitute for it. All our grain feeds are high in price this year, this is especially true of oats. Good wheat is too expensive to substitute, especially if it has to be purchased. The principal grain grown for stock feeding in the Middle Western States is corn, and it happens that there is a fairly good supply of feed corn on the market at a moderate price, at least, when compared with that of other grains.

Grains and other foods fed to animals contain the following important classes of compounds: water, protein, carbohydrates, fat, crude fibre and ash. The protein is the nitrogenous part. The animal uses it to grow muscle, hair, tendons, wool, eggs and to produce milk and sometimes for other purposes such as making fat and producing heat and energy. The carbohydrates, fats and crude fibre are used by the animal for the purpose of making fat, producing heat and doing work. Carbohydrates include the starches and sugars. Fats are about two and one-quarter times as valuable for these purposes as are carbohydrates.

Ash is used chiefly for making bone, milk and egg shells. The expensive part of food is usually the protein, but this year it happens that the carbohydrates are very expensive. The animal can use only as much of these different parts of the food as it can digest. Proteins are not all digested. Crude fibre is found in large quantities in the straws, ripe hay, bran, shorts, and more or less in all feed stuffs. It is very indigestible and so is not worth much except to lighten up a ration. Young and growing animals and dairy cows require rations fairly rich in protein, while fattening animals and working horses use more carbohydrates.

The following table shows the number of pounds of digestible nutrients in 100 pounds of food products, also the number of pounds that are indigestible, together with the ash content:

	Water	Protein	Carbohydrates	Fat	Indigestible	Ash
Wheat.....	10.5	10.2	60.2	1.7	8.4	1.8
Barley.....	10.5	8.7	65.6	1.6	13.2	2.4
Oats.....	11.0	9.2	47.3	4.2	28.3	3.0
Flax seed (ground).....	9.2	20.6	17.1	29.0	24.1	4.3
Bran.....	11.9	12.5	30.2	2.7	33.7	5.8
Shorts.....	7.7	12.5	46.9	2.8	30.1	4.6
Corn.....	10.9	7.9	66.7	4.3	10.2	1.5

If we compare barley, wheat and corn in the above table, it will be found that they are very much alike. They contain about the same amount of water. Wheat is richer than barley and barley a little richer than corn in protein. In carbohydrates, wheat is a little richer than

corn and a trifle richer than barley. Corn is much richer in oil than either wheat or barley, about two and a half times. In ash the oats are rich, barley fairly so and corn poor. The ash of corn is poorer even than it appears to be owing to the fact that the ash contains but little lime and phosphorus, both of which are necessary for growing bone.

When 100 pounds of the following grains are eaten by a farm animal the results are as follows:

Wheat	81.1	pounds digested	Oats	60.7	pounds digested
Corn	90.0	"	Shorts	62.2	"
Barley	75.9	"	Bran	56.4	"
Flax seed	65.3	"			

The following grains unground are usually bought by the bushel; if ground, by the 100 pounds or by the ton:

1 bushel wheat weighs	60 pounds
1 bushel corn weighs	56 "
1 bushel barley weighs	48 "
1 bushel flax seed weighs	56 "
1 bushel oats weighs	34 "

Bran and shorts are sold by the 100 pounds or by the ton.

One ton, 2,000 pounds, wheat furnishes	1,622	pounds digestible matter.
" " " corn	1,600	" "
" " " barley	1,518	" "
" " " flax seed	1,206	" "
" " " oats	1,214	" "
" " " shorts	1,244	" "
" " " bran	1,128	" "

The feeding value of flax seed meal is higher than represented here, owing to its high content of oil.

When the selling price of oats gets to 34 cents per bushel, it is time to look about for a substitute, and to do this intelligently one must know the characteristics and properties of the different grains, the purpose of the ration, and the particular classes of animals for which the ration is intended.

Oats have about 30 per cent. hull. This makes them bulky and light and renders them the safest of all the grains to feed to all classes of stock. It is not a fattening feed as is wheat, barley or corn. It is especially useful for feeding calves, colts, dairy cattle, brood sows and horses. The horseman finds no grain quite so satisfactory. They give spirit to the horse as no other grains do. The size and flavour of the grains induces more thorough mastication and this in itself is valuable. Oats may be used to give variety and to help balance a ration.

Wheat is a heavy, soggy grain for feeding purposes. It sticks to the animal's teeth and makes it uncomfortable. When fed alone it is the cause of much digestive trouble. It is a fattening food, and when mixed with one-fifth bran or oats, gives good results for such purposes when fed to hogs or beef cattle. Good wheat is usually too high priced for feeding purposes, but frosted wheat gives about as good returns and can be used to advantage.

Barley is a little lighter than wheat, owing to the husk that is wrapped about the kernel. It is a valuable fattening food, giving about as good results pound for pound as corn or wheat. It is rather heating in nature —too much so to feed exclusively to any farm animal. Owing to the smallness and hardness of the grains it is usually ground or boiled. Boiled barley fed to horses acts as a tonic, while if fed as a ration in the natural state it acts as a poison and causes the horse's coat to become rough and "starey." Neither cattle nor horses respond well to long feeding on barley as a sole grain diet. Its flavour is not so pleasant as oats, corn or wheat and so it is not so palatable. Barley is better fed mixed with other grains. It is equal to corn for finishing pork.

Flax seed meal is rich in protein and oil. It is not a grain that can be fed heavily to any class of stock. It has a regulating effect upon the

digestive organs and should be fed in not too large quantities along with other grains. It is usually too high priced to feed, owing to the demand for the seed for oil making purposes. It is especially valuable for calf feeding to take the place of whole milk.

Bran, besides having good feeding qualities, is like flax seed, a regulator and a tonic. It contains good amounts of protein and ash. It is not a fattening food, but is very useful in feeding calves, colts, dairy cows, brood mares and stallions. It forms an important part of all rations when it can be purchased at not too high a cost. It is almost indispensable for feeding the above classes of animals except where alfalfa can be substituted for it.

Shorts is a byproduct from wheat, somewhat similar in composition to bran, but different in physical properties. Shorts is indispensable for feeding little pigs. Bran is too bulky and too coarse for this purpose. Shorts is used extensively for feeding dairy cattle and to some extent in horse rations.

Corn is called the "king of the grains" all over the Middle West States. It is poor in protein and ash, but rich in starch and oil. It is used largely for feeding to hogs and beef cattle for fattening purposes and to horses at work in winter. It is, however, no better than barley or wheat in this respect, except that it is more palatable than either. It is too poor in protein and ash to feed exclusively to young animals, dairy cows or to breeding animals. Corn is not a balanced ration and must be mixed with other grains such as oats, bran, shorts and ground alfalfa.

Corn was a good crop in the Central States this year and feed corn is selling in Minneapolis at about 58 cents per bushel. The prices of different feeds vary according to the locality. The quotations in Saskatoon today (December, 1914) are:

Wheat.....	\$ 1.06	per bushel or \$1.77	per 100 pounds
Oats.....	.55	" " " 1.62	" " "
Barley (feed).....	.75	" " " 1.50	" " "
Flax.....	1.35	" " " 2.41	" " "
Corn.....	.84	" " " 1.50	" " "
Bran.....	23.50	" ton " 1.17½	" "
Shorts.....	27.00	" " " 1.35	" "

Rations for different classes of animals vary in the amount of nutrients of various kinds that they must contain. Dairy cattle require what is termed a fairly narrow ration, owing to the fact that they use protein in quantities in making milk. Beef cattle make use of wider rations. Pigs in the latter stages of fattening require wider rations than when they are growing. Work horses require wider rations and larger rations than do young horses. The following rations afford a basis for study:

Ration No. 1.

Ration for dairy cow weighing 1,000 pounds and giving 30 pounds of milk.

		Cents
Corn meal, 6 pounds at \$1.50 per 100 pounds.....		.09
Wheat bran, 2 " " 1.17½ " " "		.0235
" shorts, 2 " " 1.35 " " "		.027
Prairie hay, 18 " " 8.00 " ton		.072
		2125

Ration No. 2.

Oats, 10 pounds.....		.162
Bran, 2 ".....		.0235
Shorts, 2 ".....		.027
Prairie hay, 18 pounds.....		.072
		2845

Both rations can be improved by adding 1½ pounds of flax seed meal, which would increase the cost by 3½ cents. Green oat sheaves can replace prairie hay either in whole or in part. If barley can be had at 1½ cents per pound, 3 pounds of the corn in the first ration and 4 pounds

of the oats in the second may be replaced by it. A variety of food makes a more palatable ration.

Corn rations for work horses, 1,200 pounds in weight.

		Cost
Ration No. 1.—	9 pounds corn	.135
	3 " bran	.035
	1 " shorts	.0135
	12 " hay or oat sheaves	.048
		<hr/> 2315
Ration No. 2.—	6 pounds corn	.09
	6 " bran	.0705
	12 " hay	.048
		<hr/> 2085
Ration No. 3.—	6 pounds bran	.0705
	6 " shorts	.061
	12 " hay	.048
		<hr/> 1905
Ration No. 4.—	12 pounds oats	1944
	2 " bran	.0235
	12 " hay	.048
		<hr/> 2650

All of the above rations have proven satisfactory for feeding work horses in winter. No other grain or combination of grains have been found that will take the place of good oats. Oats render the work horse hard and spirited; other combinations render him soft and "logy." A little flax seed may be added to the above rations, especially if straw has to be fed for roughage.

Brood mares should receive more bran with less corn. Corn does not require to be ground for horses. However, when feed is high priced a saving of about 8 per cent can be made by grinding.

Ration for beef cattle.—Corn and barley are about equal in feeding value; corn with barley is better than barley alone. For finishing cattle the following ration is satisfactory:

Corn.....	9 pounds	Flax seed meal.....	1 pound
Bran.....	1 pound	Roughage	20 pounds

About one pound per day of this mixture for every hundred pounds live weight of animal. Oats may be substituted for bran and barley in part for corn if it can be had at $1\frac{1}{2}$ cents per pound or less.

Ration for swine.—Brood sows should have but little corn. Bran and shorts with small amount of corn will give better results at farrowing time. Oats is a good single grain, but too high in price now. For fattening purposes corn and barley are about equal. At the present price corn should be soaked or ground.

For poultry.—Corn is a fattening feed. It can not take the place of wheat or oats for egg production. It may be fed in limited quantities along with other grains.

In conclusion it must be borne in mind that corn is a fat and heat producing food; that it is low in protein and ash. It is being brought into the prairie provinces to substitute for oats and barley and low grade wheat. If it is mixed with fair amounts of bran, shorts, oats and a little flax seed meal, it will form the basis of a good safe ration. Where barley can be bought for $1\frac{1}{2}$ cents a pound or less, there is no need of buying corn at present prices. Mixed with the same feeds as corn, or if boiled, barley is equal to corn in feeding value.

In beginning the feeding of corn or in substituting corn for oats or bran ration, the change should be made in all cases gradually.



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